CLAIMS

What is claimed is:

1. A method for fine-controlling the position of a predetermined probe location relative to a fixed reference point of a probe processing apparatus fixedly coupled to an auxiliary optical laser apparatus, in which method the position is controlled with optical means, comprising the steps of:

presetting said probe location position within a predetermined converging range of 1/4 of the wave length of the applied fine-controlling positioning laser beam;

splitting said positioning laser beam having a linear polarity into a probe beam and a reference beam, whereby a respective optical beam splitting means represents said fixed reference point;

polarizing said probe beam and said reference beam in different directions to each other;

recombining a beam reflected from said probe location with said reference beam;

detecting a phase difference between said reflected beam and said reference beam; and

fine-controlling a table supporting said probe, such that the detected phase difference is minimum.

2. The method according to claim 1, in which the angle between the polarization of the incoming laser beam and the polarization direction of said reference beam or the probe beam, respectively, is 45°.

3. The method according to claim 1, in which the angle between the polarization of the incoming laser beam and the polarization direction of said reference beam or the probe beam, respectively, is selected such that the intensities of reflected probe beam and reference beam when entering the phase detection means are equal.

4. The method according to claim 1, in which the steps of splitting said positioning laser beam having a linear polarity into a probe beam and a reference beam, whereby a respective optical beam splitting means represents said fixed reference point, polarizing said probe beam and said reference beam in different directions to each other, recombining a beam reflected from

said probe location with said reference beam, detecting a phase difference between said reflected beam and said reference beam and fine-controlling a table supporting said probe, such that the detected phase difference is minimum, are each repeated continuously for a plurality of probe locations while scanning a continuous portion of a probe surface.

5. The method according to claim 1, wherein said auxiliary optical laser apparatus performs a fine-controlled auto-focusing of a laser beam associated with said probe processing apparatus.

6. The method according to claim 1, in which said auxiliary optical laser apparatus contributes to perform a fine-focusing of a microscope apparatus acting as said probe processing apparatus.

7. A method for fine-controlling the position of a predetermined probe location relative to a fixed reference point of a probe processing apparatus fixedly coupled to an auxiliary optical laser apparatus, said apparatus comprising:

means for presetting said probe location position within a predetermined converging range of 1/4 of the wave length of the applied fine-controlling positioning laser beam;

means for splitting said positioning laser beam having a linear polarity into a probe beam and a reference beam, whereby a respective optical beam splitting means represents said fixed reference point;

means for polarizing said probe beam and said reference beam in different directions to each other;

means for recombining a beam reflected from said probe location with said reference beam;

means for detecting a phase difference between said reflected beam and said reference beam; and

means for fine-controlling a table supporting said probe, such that the detected phase difference is minimum.

8. The apparatus according to claim 7 in which said means for splitting said positioning laser beam having a linear polarity into a probe beam and a reference beam, whereby a

respective optical beam splitting means represents said fixed reference point and said means for polarizing said probe beam and said reference beam in different directions to each other comprises a polarizing beam splitter.

9. The apparatus according to claim 7, wherein said means for detecting said phase difference comprises:

either a quarter-wave-plate or a Babinet-Soleil-Compensator for modifying the polarity of said recombined beam;

a polarizing beam splitter post-connected thereto; and

a pair of photo detection means, sensing the respective intensity of the split beams for control purposes.